

ON THE METHOD EMPLOYED FOR COMPUTING  $\beta$  AND  $W$ , SEE P. 61 OF THE FEBRUARY 1937 REVIEW.—ED.TABLE 3.—Total,  $I_m$ , and screened,  $I_v$ ,  $I_r$ , solar radiation intensity measurements, obtained during March 1937 and determinations of the atmospheric turbidity factor,  $\beta$ , and water-vapor content,  $w$  = depth in millimeters, if precipitated

AMERICAN UNIVERSITY, WASHINGTON, D. C.

Date and hour angle	Solar altitude	Air mass	$I_m$	$I_v$	$I_r$	$\frac{(^{\circ})}{I_v}$ 851+C	$\frac{(^{\circ})}{I_r}$ 840+C	$\beta$ mean $I_m - I_r$ and $I_v - I_r$	$\frac{(^{\circ})}{I_w = 0}$	$\frac{(^{\circ})}{I_w = 0 - I_m}$	$w$	Air-mass type
									1.94	1.94		
									Percentage of solar constant			
Mar. 1:	$^{\circ}$ $'$	$m$	<i>gr. cal.</i>	<i>gr. cal.</i>	<i>gr. cal.</i>	<i>gr. cal.</i>	<i>gr. cal.</i>				<i>mm</i>	
0:53 p. m.-----	42 23	1.48	1.312	0.920	0.754	1.070	0.876	0.085	73.7	7.3	3.4	Pc.
0:57 p. m.-----	42 18	1.48	1.306	.921	.755	1.071	.877	.088	73.4	7.3	3.4	
Mar. 16:												
3:06 a. m.-----	30 46	1.95	1.095	.849	.703	.995	.824	.128	61.6	5.7	1.8	Pc.
3:02 a. m.-----	31 36	1.90	1.124	.850	.704	.996	.825	.138	61.4	4.1	1.1	
Mar. 17:												
3:17 a. m.-----	29 48	2.01	1.184	.882	.697	1.045	.824	.076	68.0	7.0	2.6	Pc.
3:13 a. m.-----	29 19	2.04	1.193	.883	.698	1.046	.825	.070	69.4	8.0	3.4	
Mar. 19:												
2:50 a. m.-----	34 38	1.76	1.107	.836	.677	.989	.800	.068	65.6	8.6	4.4	Np.
2:46 a. m.-----	26 07	1.69	1.104	.838	.679	.992	.802	.070	65.4	8.5	4.4	

\* Values reduced to mean solar distance.

## Atmospheric conditions during turbidity measurements

Mar. 1. Temperature 8° C., wind, NW 13; polarization, 57.4 percent; visibility, 20 miles; blueness of sky, 5.  
 Mar. 16. Temperature 2° C., wind, NW 27; polarization, 51.6 percent; visibility, 12 miles; blueness of sky, 4.  
 Mar. 17. Temperature 5° C., wind, NW 26; polarization, 62.3 percent; visibility, 50 miles; blueness of sky, 6.  
 Mar. 19. Temperature 8° C., wind, NW 23; polarization, 48.9 percent; visibility, 5 miles; blueness of sky, 3.

## POSITIONS AND AREAS OF SUN SPOTS

[Communicated by Capt. J. F. Hellweg, U. S. Navy (Ret.), Superintendent U. S. Naval Observatory. Data furnished by the U. S. Naval Observatory in cooperation with Harvard and Mount Wilson Observatories. The difference in longitude is measured from the central meridian, positive west. The north latitude is positive. Areas are corrected for foreshortening and are expressed in millionths of the sun's visible hemisphere. The total area for each day includes spots and groups]

Date	East- ern stand- ard time	Heliographic			Area		Total area for each day	Observatory
		Diff. in longi- tude	Longi- tude	Lat- itude	Spot	Group		
1937, Feb. 1.....	h m 13 16	°	°	°				U. S. Naval.
		-54.0	120.0	+19.0	73			
		-47.5	126.5	-16.0		61		
		-41.0	133.0	+24.0		121		
		-37.5	136.5	+26.0		97		
		-28.0	146.0	+34.0	48			
		-21.0	153.0	-20.0		121		
		+13.0	187.0	+17.5	24			
		+16.5	190.5	-21.5		291		
		+18.0	192.0	+7.5	61			
		+23.0	197.0	-11.0		2,424		
		+27.0	201.0	+25.5		97		
		+31.0	205.0	+18.5		291		
		+47.0	221.0	+22.0		242		
		+50.5	224.5	-20.5	85		4,086	
Feb. 2.....	11 32	-41.0	120.8	+19.5	97			Do.
		-34.0	127.8	-15.5		73		
		-30.0	131.8	+24.0		145		
		-25.0	136.8	+26.5		97		
		-15.5	146.3	+34.0	48			
		-9.0	152.8	-19.0		218		
		+1.0	162.8	-31.5	61			
		+16.0	177.8	-14.5		121		
		+29.0	190.8	-21.5		339		
		+30.0	191.8	+8.0	61			
		+36.0	197.3	-10.5		2,182		
		+40.0	201.8	+25.0	97			
		+46.0	207.8	+18.5		242		
		+59.5	221.3	+23.0		242		
		+63.0	224.8	-20.5	97		4,120	
Feb. 3.....	11 11	-72.0	76.8	-11.0		170		Do.
		-69.0	79.8	+18.5	145			
		-29.5	119.3	+19.0	73			
		-21.0	127.8	-16.0		48		
		-18.0	130.8	+23.0		97		
		-11.0	137.8	+26.0		73		
		-4.0	144.8	+33.0	24			
		+4.5	153.3	-19.0		267		
		+15.0	163.8	-32.5	48			
		+30.0	178.8	-15.0		48		
		+41.0	189.8	-23.0		291		
		+43.0	191.8	+7.0	61			
		+49.0	197.8	-10.5		1,842		
		+51.0	199.8	+24.5	48			
		+60.0	208.8	+18.0		194		
		+69.0	217.8	+24.0		97		
		+78.0	226.8	+22.0	145			
		+78.0	226.8	-21.0	97		3,768	

## POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	East- ern stand- ard time	Heliographic			Area		Total area for each day	Observatory
		Diff. in longi- tude	Longi- tude	Lat- itude	Spot	Group		
1937 Feb. 4.....	h m 11 15	°	°	°				Mount Wilson.
		-70.0	65.6	-22.0		131		
		-58.0	77.6	-10.0		89		
		-55.0	80.6	+20.0		78		
		-18.0	117.6	+19.5	68			
		-8.0	127.6	-16.0		49		
		-5.0	130.6	+23.0		119		
		+2.0	137.6	+28.0		15		
		+9.0	144.6	+32.0		11		
		+18.0	153.6	-18.0		271		
		+26.0	161.6	-32.0		43		
		+42.0	177.6	-15.0		19		
		+50.0	185.6	+10.0		6		
		+53.0	188.6	-22.0		311		
		+56.0	191.6	+8.0	78			
		+61.0	196.6	-9.0		1,582		
		+66.0	201.6	+24.0	46			
		+72.0	207.6	+18.0	155		3,071	
Feb 5.....	11 17	-57.0	65.4	-22.0		194		Do.
		-50.0	72.4	+18.0	48			
		-46.5	75.9	-11.0	12			
		-41.5	80.9	+18.0		48		
		-40.5	81.9	-11.0	61			
		-3.0	119.4	+19.0	48			
		+5.0	127.4	-17.0		48		
		+9.0	131.4	+23.5		97		
		+13.0	135.4	+26.5	24			
		+21.0	143.4	+30.0	12			
		+30.5	152.9	-19.0		145		
		+40.0	162.4	-26.0	12			
		+56.0	178.4	-15.0		36		
		+60.0	182.4	-30.0		48		
		+66.0	188.4	-23.0		485		
		+69.0	191.4	+10.0	73			
		+76.0	198.4	-10.5		1,600	2,981	
Feb. 6.....	11 10	-43.0	66.3	-21.5		194		Do.
		-39.0	70.3	+19.0	48			
		-28.5	80.8	+19.0		73		
		-28.0	81.3	-11.0	73			
		+9.5	118.8	+19.0	48			
		+21.0	130.3	+22.0		97		
		+44.0	153.3	-19.0		97		
		+53.0	162.3	-26.0		85		
		+70.0	179.3	-15.0	24			
		+73.0	182.3	-30.5		109		
		+80.0	189.3	-23.0	412			
		+87.0	196.3	-10.5	145		1,405	
Feb. 7.....	11 34	-70.0	25.9	-4.0	32			Mount Wilson.
		-27.0	68.9	-21.0		44		
		-19.0	76.9	+19.0		32		
		-14.0	81.9	-10.0	21			
		+23.0	118.9	+20.0	16			
		+35.0	130.9	+23.0	24			
		+55.0	150.9	-18.0		47		
		+62.0	157.9	-25.0	37		253	

## POSITIONS AND AREAS OF SUN SPOTS—Continued

## POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	East- ern stand- ard time	Heliographic			Area		Total area for each day	Observatory
		Diff. in longi- tude	Longi- tude	Lat- tude	Spot	Group		
1937	h m	°	°	°				
Feb. 8.....	12 15	-58.0	24.4	-5.0	91	79		Mount Wilson.
		-55.0	27.4	+15.0		37		
		-16.0	66.4	-22.0		19		
		-6.0	76.4	+18.0		38		
		-2.0	80.4	-12.0		9		
		+35.0	117.4	+19.0		12		
		+48.0	130.4	+22.0		34		
		+60.0	142.4	+21.0		62		
		+70.0	152.4	-19.0		59	440	
		+79.0	161.4	-26.0				
Feb. 9.....	12 0	-45.0	24.3	-5.0	69	90		Do.
		-38.0	31.3	+17.5		70		
		-22.0	47.3	+21.0		18		
		0.0	69.3	-22.0		20		
		+7.0	76.3	+18.0		21		
		+12.0	81.3	-12.0				
		+52.0	121.3	+19.0	50		380	
		+65.0	134.3	+22.0	42			
Feb. 10.....	11 36	-30.0	26.4	-6.0	61	170		U. S. Naval.
		-25.0	31.4	+15.0		242		
		-6.0	50.4	+20.0		36		
		+13.0	69.4	-21.0				
		+63.0	119.4	+17.5	21	73	533	
Feb. 11.....	11 24	-20.5	22.8	+9.5				Do.
		-17.0	26.3	-7.0	48	121		
		-11.0	32.3	+16.0		145		
		+3.0	46.3	+20.0				
		+10.5	53.8	+20.0	242		629	
Feb. 12.....	12 1	-79.5	310.3	+15.0	242	48		Do.
		-5.0	24.8	+10.0				
		-3.0	26.8	-7.0	48	121		
		+3.0	32.8	+16.5		194		
		+17.5	47.3	+20.5		242		
		+22.0	51.8	+20.0		48	943	
		+40.0	69.8	-21.0				
Feb. 13.....	12 9	-64.0	312.6	+15.0	242	145		Do.
		+9.0	25.6	+10.0				
		+10.0	26.6	-7.0	48	145		
		+17.5	34.1	+16.5		436		
		+33.5	50.1	+21.0				
		+50.5	67.1	-21.0	48		1,064	
		-50.0	313.3	+14.0	242	291		Do.
		+22.0	25.3	+10.5		48		
		+24.0	27.3	-6.0		24		
		+26.0	29.3	+16.0		12		
		+29.0	32.3	+10.5		194		
		+32.0	35.3	+17.0		533		
		+46.0	49.3	+20.5		38	1,380	
		+67.0	70.3	-20.5				
Feb. 15.....	14 48	-68.0	280.8	+21.5	24	388		Do.
		-35.0	313.8	+14.5	242			
		+36.0	24.8	+11.0				
		+39.0	27.8	-6.0	36	436		
		+47.0	35.8	+17.0		400	1,271	
		+60.5	49.3	+20.5		29		
		-75.0	262.3	+21.0		328		
		-57.0	280.3	+22.0	29	38		
		-24.0	313.3	+15.0		362		
		+7.0	344.3	-28.0		22		
		+50.0	27.3	+12.0		136		
		+51.0	28.3	-5.5		246		
		+60.0	37.3	+18.0		39	1,600	
		+70.0	47.3	+21.0		970		
Feb. 17.....	11 10	-79.0	56.3	-34.0				U. S. Naval.
		-68.0	258.5	+21.5	24	291		
		-41.0	283.5	+21.0		36		
		-11.0	313.5	+15.0				
		+19.0	343.5	-28.0		339		
		+63.0	27.5	-6.0	12			
		+63.0	27.5	+10.5				
		+72.0	36.5	+16.0	194		1,866	
Feb. 18.....	12 20	-85.0	225.7	-10.5	88	435		Mount Wilson.
		-78.0	232.7	+16.0		799		
		-55.0	255.7	+22.0		13		
		-30.0	280.7	+23.0		121		
		+3.0	313.7	+15.0		9		
		+32.0	342.7	-28.0		254		
		+73.0	23.7	+12.0				
		+76.0	25.7	-6.5	10		1,729	
		-73.0	224.7	+17.0		73		
		-68.0	229.7	+17.0		873		
		-40.0	257.7	+21.0	12		1,018	
		-21.5	276.2	+20.5				
		-15.0	282.7	+22.0	12			
		+16.0	313.7	+15.0		145	2,133	
Feb. 20.....	13 35	-80.0	203.7	-11.0	83			Mount Wilson.
		-75.0	208.7	+13.0	15			
		-72.0	211.7	+20.0		305		
		-55.0	228.7	-11.0	70			
		-54.0	229.7	+15.0		716		
		-30.0	253.7	+21.0		855		
		-6.0	277.7	+20.0		46		
		+31.0	314.7	+15.0	109		2,199	
Feb. 21.....	13 30	-79.0	191.5	+27.0	75			Do.
		-68.0	202.5	-11.0	217			
		-60.0	210.5	+14.0		19		
		-60.0	210.5	+21.0		250		
		-43.0	227.5	-10.0	82			
		-40.0	230.5	+16.0		353		
		-17.0	253.5	+22.0		653		
		+5.0	275.5	+20.0		39		

Date	East- ern stand- ard time	Heliographic			Area		Total area for each day	Observatory
		Diff. in longi- tude	Longi- tude	Lat- tude	Spot	Group		
1937	h m	°	°	°				
Feb. 21.....	13 30	+44.0	314.5	+16.0	128		1,816	Mount Wilson.
Feb. 22.....	12 44	-77.0	180.8	-24.0	194			U. S. Naval.
		-65.0	192.8	+28.0	73			
		-55.0	202.8	-10.5	218			
		-45.0	212.8	+13.0		24		
		-45.0	212.8	+21.0		194		
		-33.0	224.8	+17.5		339		
		-30.0	227.8	-10.5	73			
		-21.0	236.8	+16.0		291		
		-5.0	252.8	+21.0		485		
		+6.0	263.8	+21.0		145		
		+19.5	277.3	+19.5		48		
		+48.0	305.8	-13.0		48		
		+58.0	315.8	+14.5	61		2,193	
Feb. 23....	11 54	-63.0	182.0	-25.0	194			Do.
		-61.0	184.0	+19.5		121		
		-51.0	194.0	+28.0	97			
		-41.0	204.0	-10.5	218			
		-34.0	211.0	+12.0		73		
		-33.0	212.0	+21.0		145		
		-19.5	225.5	+17.0		339		
		-17.5	227.5	-10.5	73			
		-9.5	235.5	+15.0		388		
		+6.0	251.0	+21.0		582		
		+21.0	266.0	+21.0		97		
		+36.0	281.0	+20.0	36			
		+70.0	315.0	+15.0	97		2,400	
Feb. 24....	12 7	-73.0	158.8	+10.0	582			Do.
		-54.0	177.8	-13.0	48			
		-50.0	181.8	+19.5		194		
		-49.5	182.3	-25.0	194			
		-39.0	192.8	+28.0	73			
		-28.5	203.3	-10.5	218			
		-19.0	212.8	+21.0		121		
		-6.0	225.8	+16.5		291		
		-4.0	227.8	-10.5	48			
		+4.0	235.8	+15.5		339		
		+20.0	251.8	+21.0		485		
		+35.0	266.8	+20.0		48	2,641	
Feb. 25....	13 30	-63.0	154.8	+10.0		630		Do.
		-39.5	178.3	-11.5	61			
		-37.0	180.8	-25.0	194			
		-37.0	180.8	+19.0		145		
		-25.0	192.8	+28.0	97			
		-13.0	204.8	-10.5	218			
		-5.0	212.8	+12.0		24		
		-5.0	212.8	+20.5		97		
		+7.0	224.8	+17.0		194		
		+10.0	227.8	-10.5	48			
		+19.0	236.8	+17.0		242		
		+33.0	250.8	+21.0		291	2,241	
Feb. 26....	11 18	-50.0	155.9	+9.5		776		Do.
		-33.0	172.9	-23.0		36		
		-27.5	178.4	-12.0	36			
		-25.0	180.9	+19.0		61		
		-24.5	181.4	-26.0	194			
		-13.0	192.9	+28.0	73			
		-1.0	204.9	-10.5	218			
		+9.0	214.9	+12.0		24		
		+10.0	215.9	+19.5		48		
		+19.5	225.4	+17.0		145		
		+21.0	226.9	-11.0	48			
		+30.0	236.9	+17.0		194		
		+45.0	250.9	+21.0		242	2,095	
Feb. 27....	13 20	-34.0	157.6	+9.5		824		Do.
		-18.0	173.6	-24.0		48		
		-15.0	176.6	+12.0		24		
		-10.0	181.6	+18.0	61			
		-10.0	181.6	-26.0	194			
		-9.0	182.6	+9.0	24			
		+0.5	192.1	+28.0		48		
		+8.0	199.6	+12.0	24			
		+12.0	203.6	-10.5	218			
		+19.0	210.6	+12.0		97		
		+23.0	214.6	+20.0	36			
		+33.0	224.6	+17.0		145		
		+36.0	227.6	-11.0	48			
		+43.0	234.6	+17.0		194		
		+57.0	248.6	+21.0		194	2,179	
Feb. 28....	12 50	-69.0	109.7	-25.0	11			Mount Wilson.
		-56.0	122.7	-17.0	4			
		-26.0	152.7	-25.0		6		
		-18.0	160.7	+9.0		788		
		-1.0	177.7	+12.0	3			
		-1.0	177.7	-11.0		6		
		+2.0	180.7	-26.0		178		
		+3.0	181.7	+18.0		46		
		+4.0	182.7	+9.0		5		
		+14.0	192.7	+27.0	10			
		+22.0	200.7	+12.0		24		
		+23.0	201.7	-16.0		12		
		+26.0	204.7	-10.0		177		
		+34.0	212.7	+13.0		69		
		+38.0	216.7	+21.0	29			
		+49.0	227.7	-10.5		33		
		+53.0	231.7	+18.0		160		
		+59.0	237.7	-20.0		85		
		+72.0	250.7	+23.0	102		1,737	

## POSITIONS AND AREAS OF SUN SPOTS

[Communicated by Capt. J. F. Hellweg, U. S. Navy (Ret.), Superintendent, U. S. Naval Observatory. Data furnished by the U. S. Naval Observatory in cooperation with Harvard and Mount Wilson Observatories. The difference in longitude is measured from the central meridian, positive west. The north latitude is positive. Areas are corrected for foreshortening and are expressed in millionths of the sun's visible hemisphere. The total area for each day includes spots and groups.]

Date	East- ern stand- ard time	Heliographic			Area		Total area for each day	Observatory
		Diff. in longi- tude	Longi- tude	Lat- itude	Spot	Group		
1937	h. m.	°	°	°				
Mar. 1	11 53	-14.0	152.0	-25.0		48		U. S. Naval.
		-6.0	160.0	+10.0		573		
		+8.5	174.5	-25.0		255		
		+14.5	180.5	+19.5	48			
		+37.0	203.0	-10.0		218		
		+41.0	207.0	+12.5		73		
		+50.0	216.0	+20.0	24			
		+60.0	226.0	+17.0	97			
		+61.0	227.0	-11.0	48			
		+70.0	236.0	+16.5	121			
		+73.0	239.0	-21.0		388	2,193	
Mar. 2	11 3	+0.5	153.8	-25.0	24			Do.
		+7.0	160.3	+10.0		970		
		+21.0	174.3	-25.0		388		
		+28.0	181.3	+30.0	12			
		+28.0	181.3	+19.5	48			
		+51.0	204.3	-10.5		206		
		+55.0	208.3	+13.0		73		
		+62.0	215.3	+20.0	12			
		+72.0	225.3	+16.5	97			
		+73.0	226.3	-11.5	48			
		+86.0	239.3	-22.0	12		1,890	
Mar. 3	11 12	+14.0	154.0	-25.0	12			Do.
		+21.0	161.0	+9.5		921		
		+29.0	169.0	-23.0		48		
		+39.0	179.0	-25.5		145		
		+40.0	180.0	+20.0	24			
		+40.5	180.5	+30.0		48		
		+65.0	204.0	-10.0	194		1,392	
Mar. 4	11 18	-75.0	51.8	+11.0	97			Do.
		-55.0	71.8	+20.0		145		
		-53.0	73.8	-30.0		61		
		+34.5	161.3	+9.5		776		
		+41.0	167.8	-24.0	48			
		+51.0	177.8	-25.5		97		
		+51.0	177.8	+30.5	48			
		+79.0	205.8	-10.5	145		1,417	
Mar. 5	11 6	-65.0	48.7	+11.0		145		Do.
		-41.5	72.2	+20.0		339		
		-40.5	73.2	-30.0		121		
		+49.0	162.7	+9.5		679	1,284	
Mar. 6	11 14	-65.0	35.5	+9.5	24			Do.
		-50.5	50.0	+11.0		170		
		-28.0	72.5	+19.5		679		
		-27.0	73.5	-30.0		97		
		+62.0	162.5	+9.5		533	1,503	
Mar. 7	10 55	-50.0	37.5	+10.0	12			Do.
		-42.0	45.5	+14.0		73		
		-38.0	49.5	+11.0		121		
		-14.0	73.5	+20.0		533		
		-13.0	74.5	-30.0		97		
		+78.0	165.5	+9.0	485		1,321	
Mar. 8	14 7	-63.0	9.6	+13.0		97		Do.
		-49.5	23.1	+17.0		73		
		-39.0	33.6	+9.5	6			
		-30.5	42.1	+24.0		73		
		-23.0	49.6	+12.0		97		
		0.0	72.6	+20.0		533		
		+3.5	76.1	-29.5	97			
		+48.0	120.6	-19.0		97	1,073	
Mar. 9	9 37	-52.0	9.9	+14.0		145		Mount Wilson.
		-43.0	18.9	+31.0		145		
		-42.0	19.9	+12.0	36			
		-37.0	24.9	+17.0		61		
		-25.0	36.9	+9.5	12			
		-20.5	41.4	+24.0		61		
		-10.5	51.4	+11.5	48			
		+10.0	71.9	+19.5		582		
		+16.0	77.9	-29.5	97			
		+57.0	118.9	-19.5		109	1,206	
Mar. 10	11 12	-37.0	10.8	+13.0		97		U. S. Naval.
		-31.0	16.8	+31.0	24			
		-28.0	19.8	+11.5	48			
		-24.0	23.8	+30.0	61			
		-6.0	41.8	+24.0		48		
		+3.0	50.8	+12.0	61			
		+20.0	67.8	+21.0		97		
		+30.0	77.8	+19.5	291			
		+30.5	78.3	-29.0	97			
		+73.0	120.8	-19.5		97	921	
Mar. 11	12 14	-25.0	9.1	+13.0		145		Do.
		-15.0	19.1	+11.0		48		
		-10.0	24.1	+29.5	48			
		+6.0	40.1	+25.0	12			
		+10.0	44.1	+22.0	12			
		+18.0	52.1	+11.5		48		
		+33.0	67.1	+21.0		48		
		+43.0	77.1	+19.5	436			

## POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	East- ern stand- ard time	Heliographic			Area		Total area for each day	Observatory
		Diff. in longi- tude	Longi- tude	Lat- itude	Spot	Group		
1937	h. m.	°	°	°				
Mar. 11	12 14	+46.0	80.1	-29.5	121		918	U. S. Naval.
Mar. 12	10 56	-13.0	8.6	+13.0		121		
		-6.0	15.6	+32.0	36			
		-2.5	19.1	+30.0	36			
		-2.0	19.6	+10.5	24			
		+2.5	24.1	+29.5	36			
		+30.0	51.6	+11.0		48		
		+56.0	77.6	+19.5	436			
		+59.5	81.1	-29.0	121		858	
Mar. 16	10 53	-22.5	306.4	-23.0		97		Do.
		+44.0	12.9	+15.0		61	158	
Mar. 17	11 13	-11.0	304.5	-22.0		97		Do.
		+58.0	13.5	+15.0		61	158	
Mar. 18	13 45	+3.0	304.0	-23.0	41			Harvard.
		+10.0	311.0	-21.0	83		124	
Mar. 19	12 26	-22.5	266.0	+26.0	48			U. S. Naval.
		+19.5	308.0	-22.0	48		96	
Mar. 20	11 2	-86.0	190.1	+8.0	73			Mount Wilson.
		-70.0	206.1	-10.5	24			
		-69.0	207.1	+6.0	48			
		-69.0	207.1	-16.5	24			
		-13.0	263.1	+24.5		121		
		+31.0	307.1	-22.0	36		326	
Mar. 21	11 35	-76.0	186.6	+10.0	145			Do.
		-69.0	193.6	+8.0	242			
		-57.5	205.1	-11.0	24			
		-56.0	206.6	-18.0		145		
		-3.0	259.6	+24.0	12			
		+2.0	264.6	+25.0		48		
		+45.0	307.6	-22.5	36		652	
Mar. 22	14 56	-83.0	164.6	+8.0	436			U. S. Naval.
		-70.0	177.6	-14.0	97			
		-60.0	187.6	+10.0	71			
		-51.5	196.1	+8.0	121			
		-40.0	207.6	-11.0	24			
		-39.5	208.1	-18.0		48		
		+3.0	250.6	+23.5		48		
		+7.0	254.6	+11.0		48		
		+30.5	278.1	-25.0		97		
Mar. 23	11 18	+59.0	306.6	-21.5	48		1,038	
		-79.0	157.4	+10.0	291			Do.
		-70.0	166.4	+8.0	485			
		-60.0	176.4	-14.5	73			
		-48.0	188.4	+10.0	48			
		-40.0	196.4	+8.0	170			
		-29.5	206.9	-11.0	24			
		-29.0	207.4	-18.0		48		
		+11.0	247.4	+24.0	24			
		+42.0	278.4	-25.0		145		
Mar. 24	11 7	+70.0	306.4	-22.0	36		1,344	
		-66.0	157.3	+10.5		679		Do.
		-57.0	166.3	+7.0	485			
		-54.0	169.3	+17.5		48		
		-46.0	177.3	-15.0	73			
		-26.5	196.8	+7.5	194			
Mar. 25	11 30	+55.0	278.3	-25.0		73	1,552	
		-68.0	151.9	+11.0		388		Do.
		-49.5	160.4	+10.0		194		
		-43.0	166.9	+7.0		485		
		-39.5	170.4	+18.0	24			
		-34.0	175.9	-15.0	73			
		-19.0	190.9	+19.0	24			
		-13.0	196.9	+7.5	109			
Mar. 26	11 31	+71.0	280.9	-25.5	61		1,358	
		-43.0	153.7	+11.0		339		Do.
		-34.5	162.2	+10.0		218		
		-29.5	167.2	+7.0		436		
		-24.0	172.7	+18.0	24			
		-19.0	177.7	-15.0		97		
		-5.5	191.2	+18.5	48			
		+0.5	197.2	+7.5	73			
		+12.0	208.7	-19.5		97	1,333	
Mar. 27	11 7	-75.0	108.7	-8.0	145			Do.
		-30.0	153.7	+11.0		291		
		-20.5	163.2	+9.5		218		
		-16.5	167.2	+7.0		436		
		-13.0	170.7	+18.0		48		
		-6.0	177.7	-14.0		73		
		+9.0	192.7	+19.5		291		
		+14.0	197.7	+7.5		73		
Mar. 28	12 6	+26.0	209.7	-19.5	61		1,636	
		-60.0	110.0	-8.0	121			Do.
		-17.0	153.0	+11.0		291		
		-6.5	163.5	+9.5	206			
		-3.0	167.0	+7.0		388		
		+7.0	177.0	-15.5		97		
		+23.0	193.0	+19.0		388		
		+29.0	199.0	+7.0	48			
		+40.0	210.0	+10.0		73	1,612	
Mar. 29	11 32	-63.0	94.1	+9.5	48			Do.
		-48.0	109.1	-8.5	121			
		-4.0	153.1	+11.0		291		
		+7.0	164.1	+9.5		194		
		+10.5	167.6	+7.0		339		
		+20.5	177.6	-15.0		73		

## POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	East- ern stand- ard time	Heliographic			Area		Total area for each day	Observatory
		Diff. in longi- tude	Longi- tude	Lat- itude	Spot	Group		
Mar. 29...	h. m. 11 15	° +36.0 +40.5 +50.0	° 193.1 197.6 207.1	° +19.0 +8.0 +10.0	----- 36 24	436 ----- -----	----- 1,562 -----	U. S. Naval.
Mar. 30...	12 14	° -56.5 -49.5 -33.0 +10.5 +20.5 +24.0 +36.0 +44.0 +50.0 +54.0	° 87.1 94.1 110.6 154.1 164.1 167.6 179.6 187.6 193.6 197.6	° +15.0 +9.0 -9.0 +11.0 +9.5 +7.0 -15.0 +17.0 +20.5 +19.0	----- 97 73 97 ----- 242 ----- 194 ----- 48 48 121	----- ----- ----- ----- 291 ----- ----- ----- ----- ----- 242	----- ----- ----- ----- ----- ----- ----- ----- ----- ----- 1,453	
Mar. 31...	11 15	° -71.0 -43.0 -36.5 -21.0 +5.0 +23.0 +33.0 +38.0 +49.0 +63.0 +69.0	° 59.9 87.9 94.4 109.9 135.9 153.9 163.9 168.9 179.9 193.9 199.9	° +23.0 +16.0 +9.0 -9.0 +9.5 +10.5 +9.0 +6.5 -15.0 +19.0 +17.0	----- 145 ----- 170 ----- 97 ----- 145 170 ----- 242 ----- 242 48 ----- 242 194	----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- -----	----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- 1,792	

Mean daily area for 28 days, 1,152.

PROVISIONAL SUN-SPOT RELATIVE NUMBERS FOR  
MARCH 1937

[Dependent alone on observations at Zurich and its station at Arosa]

[Through the courtesy of Prof. W. Brunner, Eidgen. Sternwarte, Zurich, Switzerland]

March 1937	Relative numbers	March 1937	Relative numbers	March 1937	Relative numbers
1.....	Wac 154	11.....	98	21.....	Eac 62
2.....	b 154	12.....	59	22.....	Mc 74
3.....	Ec 109	13.....	a 41	23.....	d 107
4.....	Ecd 65	14.....	21	24.....	d ---
5.....	76	15.....	20	25.....	87
6.....	71	16.....	Ec 23	26.....	a 80
7.....	Wc 105	17.....	22	27.....	Mac 118
8.....	abd 115	18.....	Eac 37	28.....	131
9.....	107	19.....	33	29.....	a 117
10.....	99	20.....	d ---	30.....	a 135
				31.....	a 145

Mean, 29 days=85.0.

a= Passage of an average-sized group through the central meridian.

b= Passage of a large group or spot through the central meridian.

c= New formation of a group developing into a middle-sized or large center of activity; E, on the eastern part of the sun's disk; W, on the western part; M, on the central circle zone.

d= Entrance of a large or average-sized center of activity on the east limb.

## AEROLOGICAL OBSERVATIONS

[Aerological Division, D. M. LITTLE, in charge]

By L. P. HARRISON

Mean free-air data based on airplane weather observations during the month of March 1937 are given in tables 1 to 3. A description of the methods by which the various monthly means and normals therein are computed may be found in this section of the MONTHLY WEATHER REVIEW for January 1937. The "normals" of temperature, pressure, and relative humidity at the 1,500 and 2,500 meter levels for the Navy stations were obtained in a manner slightly different from the usual method. Prior to the year 1934, the data in the columns for 1,500 and 2,500 meters were not computed. It has been found expedient to obtain these data by linear interpolation for the purpose of the present summary.

It will be noted that many of the "normals" are based on only 3 years of observations. Conclusions based on departures from such short-period "normals" must be used with caution.

The mean surface temperatures for March (see chart I) were below normal over the country except in the Pacific coastal States, and Nevada, southern Utah, western Colorado, as well as Idaho, Montana, and North Dakota, where they were generally above normal. The largest negative departures at the surface were largely concentrated in the south-central part of the country, with values ranging from about  $-1.5^{\circ}\text{C.}$  to  $-3.4^{\circ}\text{C.}$  In addition, a secondary region of rather pronounced negative departures at the surface occurred in a strip nearly 150 miles wide extending from the vicinity of western Tennessee northeastward to about Burlington, Vt., with a lower extreme departure of nearly  $-3.0^{\circ}\text{C.}$  The largest positive departures were principally confined to the northwestern border states with values ranging from  $+0.5^{\circ}\text{C.}$  to  $+2.5^{\circ}\text{C.}$  Elsewhere the departures were generally within the range  $\pm 1.5^{\circ}\text{C.}$

The mean free-air temperatures for the month up to 5 km above sea level (table 1) were generally below normal over the country except the extreme northwestern section and the Florida Peninsula and vicinity, where they were

above normal. In harmony with the conditions at the surface, the most pronounced negative departures from normal were principally confined to an elliptical area extending (lengthwise) from the south-central to the north-eastern portion of the country, with the major axis roughly thrice the minor axis. The departures in this area ranged approximately from  $-1.5^{\circ}\text{C.}$  to  $-5.5^{\circ}\text{C.}$  (Oklahoma City at 1 km), with departures slightly more pronounced over the northeastern than over the northwestern sector above 2 km. In the extreme southwest, significantly subnormal free-air temperatures also occurred as exemplified by departures from  $-0.6^{\circ}\text{C.}$  to  $-2.9^{\circ}\text{C.}$  (at 2 km) over San Diego, Calif. The most pronounced positive departures occurred over the general area comprising the Northwestern States from Washington to Montana, with values ranging as high as  $+4.2^{\circ}\text{C.}$  (Spokane at 5 km). Elsewhere over the country, the departures from normal temperature were not very marked.

The mean free-air relative humidities and specific humidities are given in table 2. The mean relative humidities were moderately above normal in the Southwest, with maximum departures occurring at San Diego where they ranged from  $+4$  to  $+13$  percent. Over the central part of the country the departures were also generally positive by moderate amounts below 2 km, while above that elevation they were only slightly in excess of normal. Over the northern third of the country only slight positive departures from normal relative humidity generally prevailed, with maxima occurring near Billings and Boston, particularly in the lower strata ( $+10$  percent at surface, falling to  $+6$  percent at 1 km, over the former station; and  $+5$  to  $+9$  percent from 1 to 3 km, over the latter). Over the southeast, slight to moderate negative departures generally prevailed, except near the surface along the Gulf coast where the opposite was true. The extreme departures in this area occurred in the vicinity of Murfreesboro, Tenn., where the deficiencies with respect to normal ranged between  $-2$  percent and